

The new Australian Ground-Hunting Spider Genus *Leichhardtus* (Araneae: Corinnidae)

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ABSTRACT

The new corinnid genus *Leichhardtus* is described including eight new species from eastern Australia: *L. albofasciatus*, *L. badius*, *L. bimaculatus*, *L. conopalpis*, *L. garretti*, *L. kroombit*, *L. reinhardi* and *L. terriirwinae*. A key to the species is provided. Only one species is widely distributed, four species are collected only in rainforests and three species are recorded only from a single location. □ *Biogeography, Morphology, New Species, Taxonomy, Corinnidae.*

Ground-hunting spiders of the family Corinnidae are among the most diverse of the ground spider families with 1014 described species in 87 genera (Platnick 2012). These very fast medium-sized runners have a highly variable somatic morphology ranging from species with soft abdomens to those with leathery scutes covering the whole dorsum. The corinnid fauna is most diverse in tropical and subtropical regions (Bonaldo & Brescovit 2005; Haddad 2006a, b; Haddad & Bosselaers 2010; Lyle & Haddad 2010). Up until now, 19 corinnid species in six genera have been described from Australia. The new genus *Leichhardtus* belongs, together with *Coriinuomma* Karsch, 1880, *Medmassa* Simon, 1887, *Methesis* Simon, 1896, *Pocilipta* Simon, 1897, and *Supunna* Simon, 1897, to the subfamily Castianeirinae. *Leichhardtus* differs from all other described Australian Castianeirinae genera in having an enlarged palpal femur in males, and males and females in having four pairs of spines on ventral tibiae I and II.

Bush Blitz 2010 and 2011 to Dananbilla Nature Reserve (New South Wales) and Ned's Corner (Victoria) yielded key specimens from an unknown ground hunting spider genus

(Corinnidae). A Bush Blitz Tactical Taxonomy Grant presented the opportunity to revise this new genus, expanding our knowledge of the unique Biodiversity of Australia's fauna. Of the species discovered, the rainforest species are most likely short range endemics (Harvey 2002) and may prove to be important taxa for monitoring the effects of climate change (Baehr 2011; Baehr, Raven & Hebron 2011).

MATERIAL AND METHODS

Specimens are preserved in 75% ethanol and were examined using a Leica MZ16A microscope. Photomicrographical images were produced using a Leica DFC 500 and the software program Auto-Montage Pro Version 5.02 (p). The scanning electron micrographs were taken with a Hitachi S-530 scanning electron microscope. Epigynes and palps were drawn with a camera lucida on a Zeiss Stemi SV6 microscope. The specimens are lodged in: AM, Australian Museum, Sydney; MV, Museum Victoria, Melbourne; QM, Queensland Museum, Brisbane; WAM, Western Australian Museum, Perth. All measurements are in millimetres. Abbreviations are used in the text as follows: AME, anterior median eyes; ALE, anterior lateral eyes; ALS, anterior

lateral spinnerets; CO, copulatory opening; ED, epigynal duct; S, spermatheca; PLE, posterior lateral eyes; PLS, posterior lateral spinnerets; PME, anterior median eyes; PMS, posterior median spinnerets; RCH, retrocoxal hymen.

The species descriptions contain only the differences from the generic description. The description of the females includes only the differences from the male.

SYSTEMATICS

Family Corinnidae Karsch, 1880

Leichhardtus Raven & Baehr, new genus

Type species. *Leichhardtus conopalpis* sp. nov.

Etymology. The generic name is in honour of the German explorer and scientist, Ludwig Leichhardt (1813–1848), who came to Australia in 1842 to study its wildlife. This is for his 200th Birthday in 2013.

Diagnosis. Differs from all other Australian Castianeirinae genera in having an enlarged palpal femur, four pairs of spines on ventral tibiae I and II; females have a pair of open crescentic fossae in biconvex configuration with a narrow curving insemination duct leading to two similarly large pear-shaped receptacula.

Description. *Male:* total length 6.09–9.63. *Colour:* Prosoma, mouthparts yellow orange to dark brown, legs yellow orange to yellow brown with or without dark markings. *Opisthosoma* dark brown with or without pale spots or chevrons. *Prosoma:* pyriform in dorsal view, head narrowed to about 0.60, widest at middle, pars cephalica flat in lateral view, with rounded posterolateral corners, surface granulate, with fovea at middle of carapace, lateral margin rebordered. Clypeus straight in front view, vertical in lateral view, with divided chilum, high, ALE separated from edge of carapace by 1.5–2 times their diameter. *Eyes:* eight, well developed, equal sized or AME largest; all eyes circular; posterior eye row procurved from above. *Sternum* (Fig. 3C) heart-shaped, surface punctated. *Chelicerae* straight, base laterally bulging, promargin with 3 teeth, retromargin with 2 teeth, paturon with distal lobe covered with fringe of long setae. Labium rectangular,

anterior margin straight with white seam and line of strong setae. Endites rectangular, twice as long as labium, with white seam, anteromedian part with brush-like structure; serrula present in single row. *Opisthosoma:* ovoid, rounded posteriorly (Fig. 3A) with or without large oval dorsal scute covering $\frac{1}{2}$ – $\frac{3}{4}$ of abdomen, venter with yellow orange epigastric scute. *Spinnerets* (Fig. 7H): PLS slightly larger than PMS, two-segmented with 3 enlarged spigots and 3 enlarged spigots on PMS in females. Only one enlarged spigot on inner ALS. *Legs:* Coxae entally rounded with slight retrobasal process; RCH small; trochanters symmetrically notched about twice as wide as deep, similar on all legs; no feathery hairs on legs; covered mostly by bristles; tarsi cylindrical. *Trichobothria:* tarsi & metatarsi with few (2–4 evident) short distally; tibia with cluster of trichae basally; spines, I: femur p1d3; tibia v2.2.2.2; metatarsus v2.2. II: femur p2d3; tibia p2v2.2.2.2; metatarsus v2.2. III: femur p3d3r3; tibia p2d2r2v2.2.2; metatarsus p3r3v2.2.2. IV: femur p2d3r1; tibia p2d3r2v2.2.2; metatarsus p3r3v2.2.2. *Palp:* femur p1d2; patella p1; tibia p2. *Claws.* Enclosed in short dense tufts; claws and tufts on legs I and II very small, lower than diameter of tarsi; longer with 3–4 small teeth on legs III, IV. *Scopula.* Fringe of short scopuliform hairs on ventral tarsi I–IV and for distal half (I, II) to one quarter (III, IV) of metatarsi. *Palp:* Femur enlarged or with conical process ventrally. Tibia cylindrical but with distinct glabrous saddle distoventrally for half of prolateral edge where small process interlocks with ovoid depression on opposed cymbial edge. Cymbium with sinuous retrolateral margin with or without conical spine-like process. Bulb pyriform with corkscrew-shaped embolus. Sperm duct folds back strongly toward embolus then reflexes back sharply; round base of short embolus with reflexed flattened apex.

Female. Total length 6.83–9.71. *Abdomen:* with or without small dorsal scute. *Epigyne* (Fig. 3J, K) about as long as wide, longer than wide or wider than long, copulatory openings (CO) near lateral margin about halfway between epigastric fold and anterior end of epigyne, epigynal ducts short, semicircular, laterally connected to S-shaped spermathecae, spermathecae anterior part pear-shaped smooth with small lateral glandulae, posterior part with 4–5 diverticulae.

KEY TO SPECIES OF *LEICHHARDTEUS*

1. Males 2
 - Females (unknown for *L. bimaculatus*, *L. terriirwiniae*) 9
2. Palpal femur with conical ventral process (Figs 3I, 7I, 10G) 3
 - Palpal femur without conical ventral process (Figs 4I, 5H, 6G, 8G, 9I) 5
3. Carapace yellow orange front dark brown (Figs 1, 3A) *L. conopalpis*
 - Carapace dark unicoloured (Fig. 7A, 10A) 4
4. Cymbium without retrolateral spine (Fig. 7K) *L. garretti*
 - Cymbium with well developed retrolateral spine (Fig. 10G) *L. terriirwiniae*
5. Carapace yellow orange front dark brown (Figs 9A) *L. reinhardi*
 - Carapace unicoloured 6
6. Opisthosoma with pale dorsomedian stripe (Fig. 4A) *L. albofasciatus*
 - Opisthosoma without median stripe 7
7. Opisthosoma dorsally dark, with 1 pair of pale spots (Fig. 6A) *L. bimaculatus*
 - Opisthosoma different 8
8. Opisthosoma with pale dorsal chevrons covering all (Fig. 5A) *L. badius*
 - Opisthosoma with pale dorsal chevrons only in front (Fig. 8A) *L. kroombit*
9. Carapace yellow orange front dark brown (Figs 1, 9B) 10
 - Carapace unicoloured (Figs 4B, 5B, 7B, 8B) 11
10. Opisthosoma completely dark brown (Fig. 9B) *L. reinhardi*
 - Opisthosoma with small arrow-shaped pale spot posteriorly (Fig. 3B) *L. conopalpis*
11. Opisthosoma with pale dorsomedian stripe (Fig. 4B) *L. albofasciatus*
 - Opisthosoma different 12
12. Opisthosoma with pale dorsal chevrons covering all (Fig. 5B) *L. badius*
 - Opisthosoma with pale dorsal chevrons only in front (Fig. 8B) 13
13. Copulatory opening inverted u-shaped posteriorly open (Fig. 7L) *L. garretti*
 - Copulatory opening circular (Fig. 8J) *L. kroombit*



FIG. 1. *Leichhardteus conopalpis*, habitus.



FIG. 2. Bulbal tips. A, *Leichhardtia conopalpis* (QM S92473), B. *L. garretti* (QM S68111), C. *L. binaculatus* (QM S14709); D, *L. kroombit* (QM S92472); E, *L. terriirwiniae* (QM S38609); F, *L. albofasciatus* (QM S25194); G, *L. reinhardi* (S92342); H, *L. badius* (QM S31555). Scale 0.1 mm.

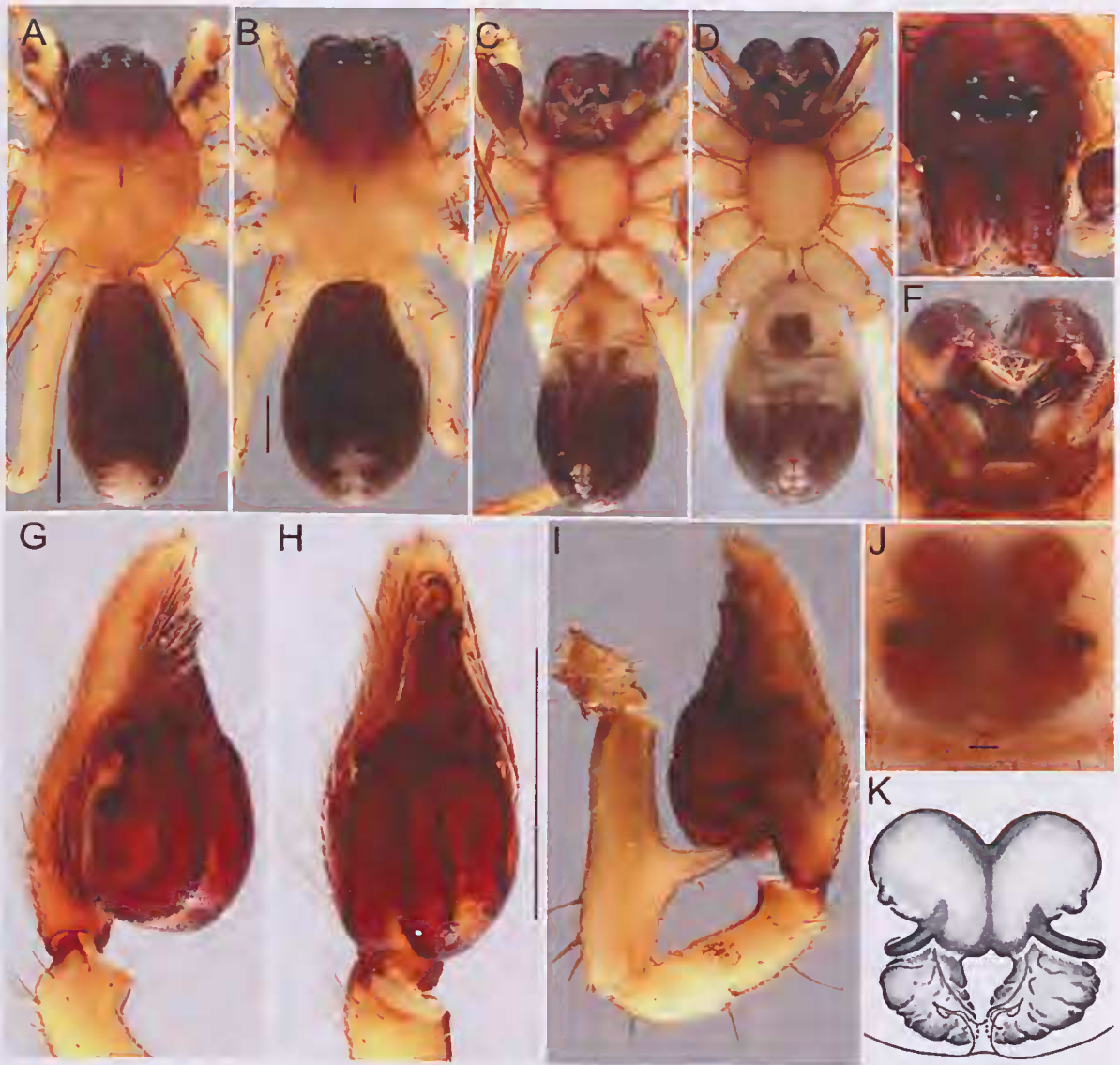


FIG. 3. *Leichhardteus conopalpis*, male (QM S52729), female (QM S53920). A, Habitus, dorsal view, male; B, Same, female; C, Habitus, ventral view, male; D, Same, female; E, Prosoma, frontal view, male; F, Mouthparts, ventral view, female; G, Male palp, prolateral view; H, Male palp, ventral view; I, Male palp, retrolateral view; J, Female epigyne ventral view; K, Female epigyne dorsal view. Scale 1 mm, epigyne 0.1 mm.

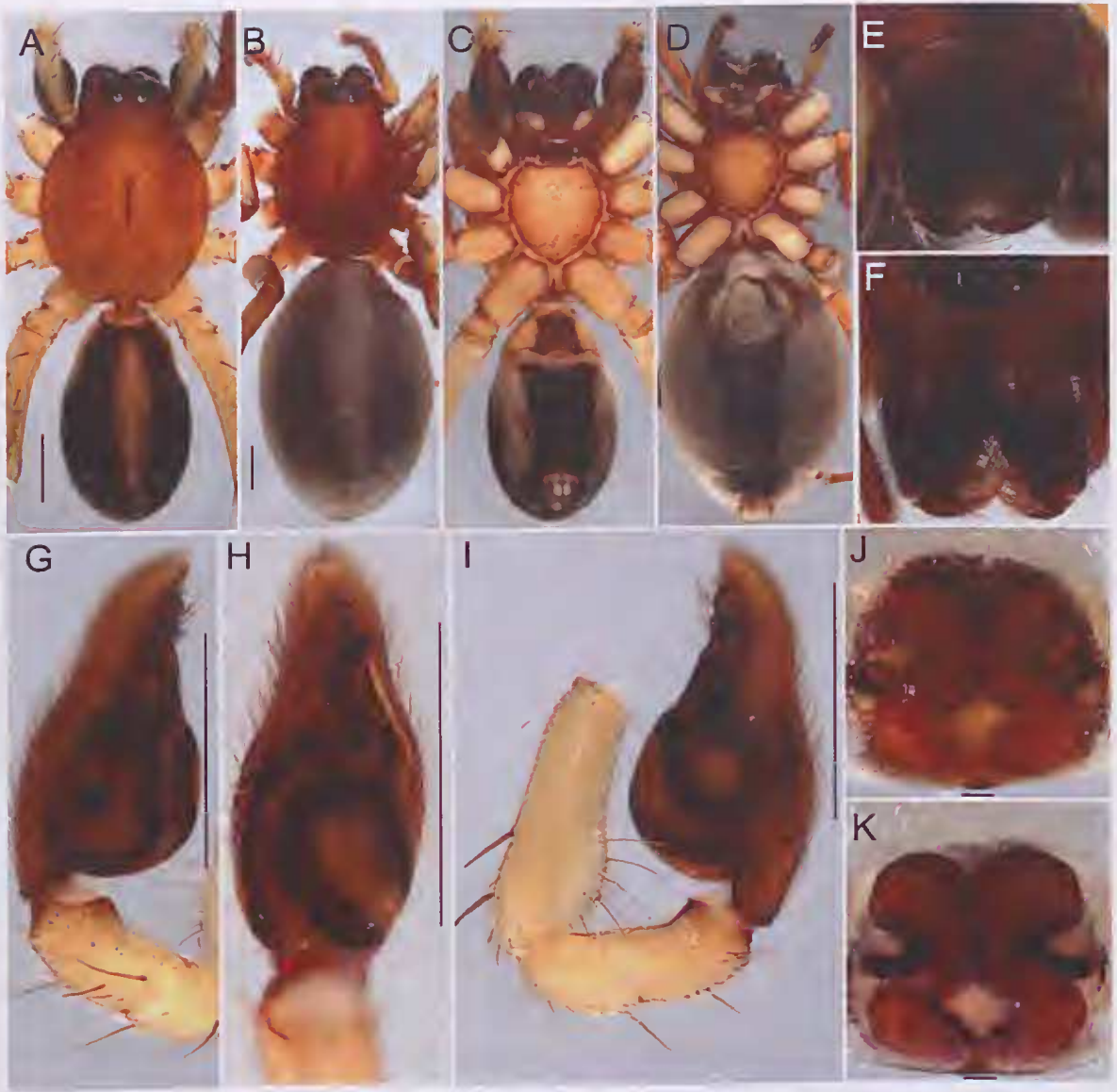


FIG. 4. *Leichhardtia albofasciatus*, male (QM S29577), female (QM S76352); A, Habitus, dorsal view, male; B, Same, female; C, Habitus, dorsal view, male; D, Same, female; E, Prosoma, frontal view, male; F, Same, female; G, Male palp, prolateral view; H, Same, ventral view; I, Same, retrolateral view; J, Female epigyne ventral view; K, Female epigyne dorsal view. Scale 1 mm; epigyne, 0.1 mm.



FIG. 5. *Leichhardteus badius*, male (QM S31555), female (QM S31545). A, Habitus, dorsal view, male; B, Same, female; C, Habitus, ventral view, male; D, Same, female; E, Prosoma, frontal view, male; F, Mouthparts, ventral view, female; G, Male palp, ventral view; H, Same, retrolateral view; I, Same, dorsal view (spine); J, Female epigyne ventral view; K, Female epigyne dorsal view. Scale 1 mm; epigyne, 0.1 mm.

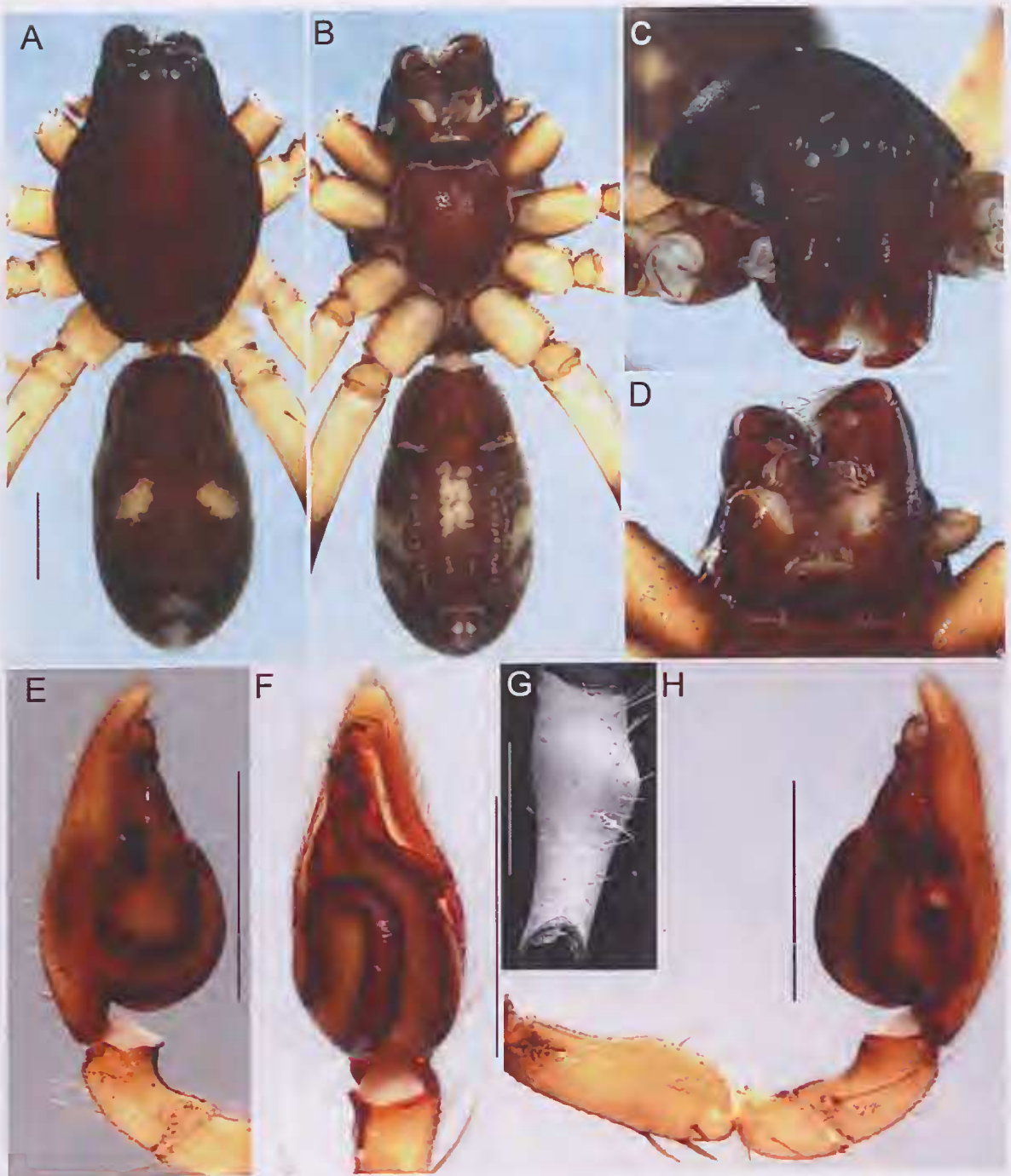


FIG. 6. *Leichhardtus bimaculatus*, male (QM S14709). A, Habitus, dorsal view; B, Same, ventral view; C, Prosoma, frontal view, male; D, Mouthparts, ventral view, male; E, Male palp, prolateral view; F, Same, ventral view; G, Palpal femur, ventral view; H, Same, retrolateral view. Scale 1 mm, femur 0.5 mm.



FIG. 7. *Leichhardteus garretti*, male (QM S68111), female (QM S68110). A, Habitus, dorsal view, male; B, Prosoma, dorsal view, female; C, Opisthosoma, dorsal view, female (QM S55397); D, Habitus, ventral view, male; E, Prosoma, ventral view, female; F, Opisthosoma, ventral view, female (QM S55397); G, Mouthparts, ventral view, female; H, Spinnerets, female (QM S55397) ventral view; I, Male palp, prolateral view; J, Same, ventral view; K, Same, retrolateral view; L, Female epigyne ventral view; M, Female epigyne dorsal view. Scale 1 mm; epigyne, 0.1 mm.

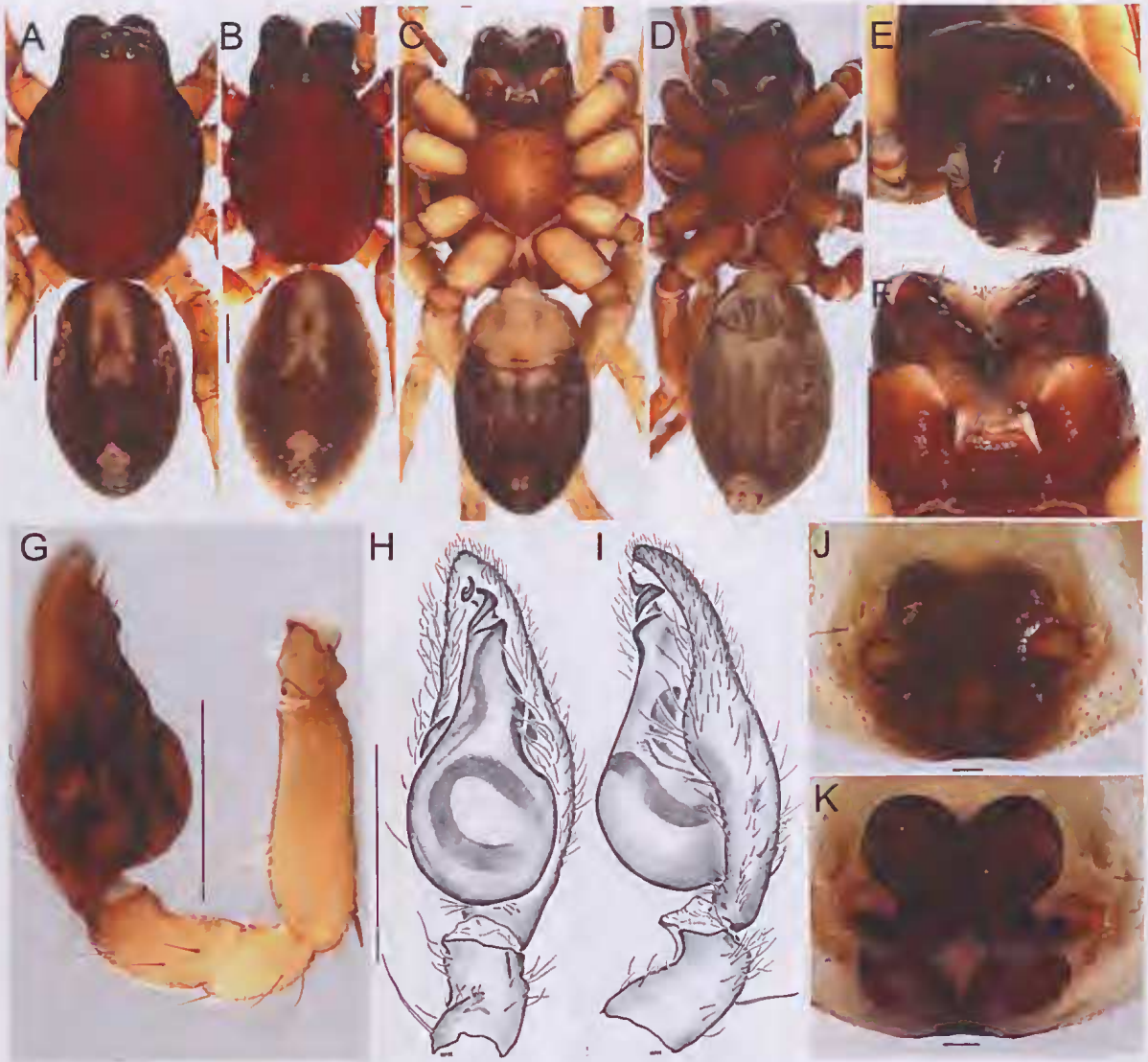


FIG. 8. *Leichhardtia kroombit*, male (QM S92472), female (QM S31542). A, Habitus, dorsal view, male; B, Same, female; C, Habitus, ventral view, male; D, Same, female; E, Prosoma, frontal view, male; F, Mouthparts, ventral view, male; G, Male palp, prolateral view; H, Male palp, ventral view; I, Same, retrolateral view; J, Female epigyne ventral view; K, Female epigyne dorsal view. Scale 1 mm; epigyne, 0.1 mm.

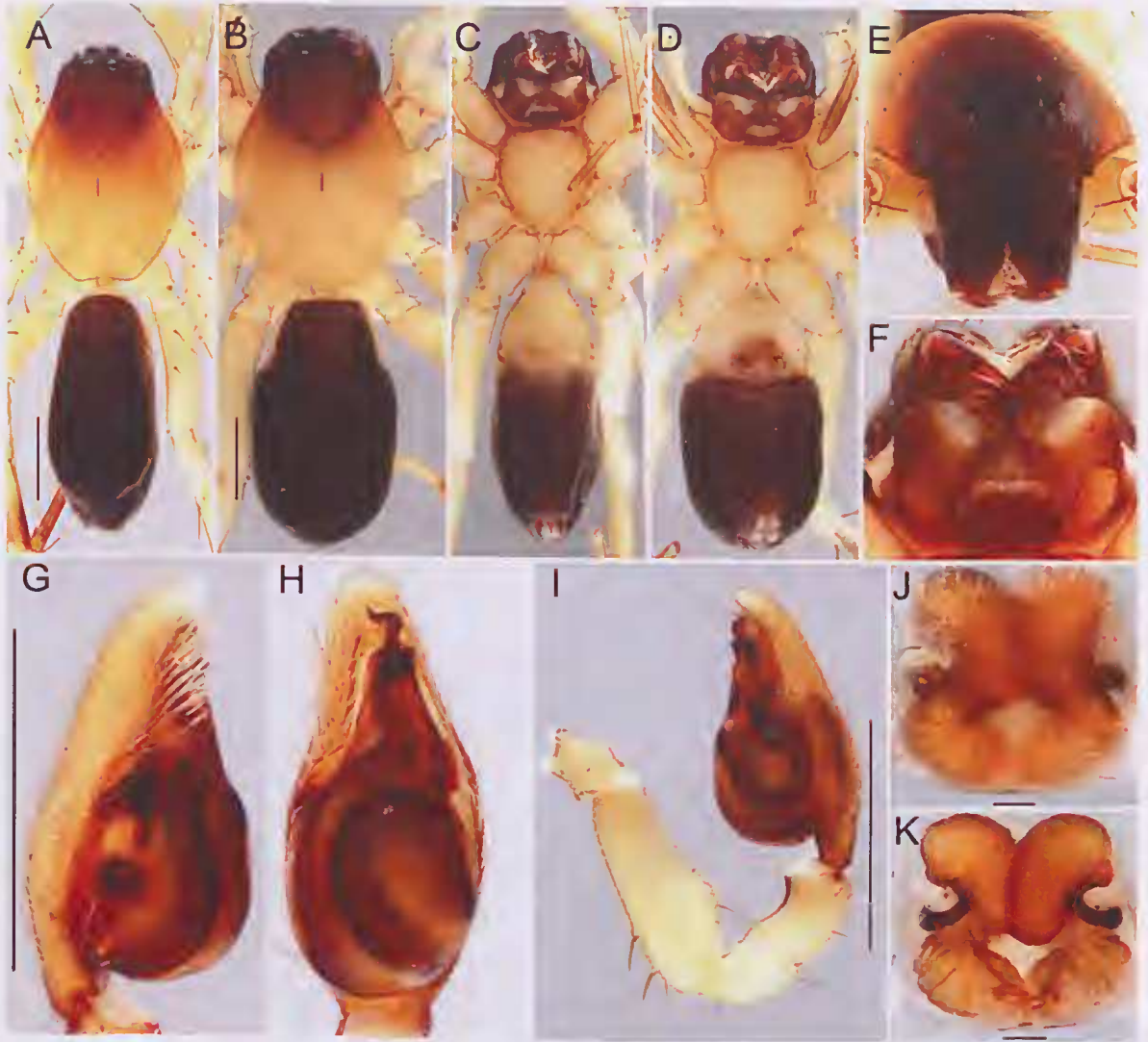


FIG. 9. *Leichhardteus reinhardi* male (QM S92342), female (QM S79286). A, Habitus, dorsal view, male; B, Same, female; C, Habitus, ventral view, male; D, Same, female; E, Prosoma, frontal view, male; F, Mouthparts, ventral view, male; G, Male palp, prolateral view; H, Male palp, ventral view; I, Same, retrolateral view; J, Female epigyne ventral view; K, Female epigyne dorsal view. Scale 1 mm; epigyne, 0.1 mm.



FIG. 10. *Leichhardteus terriirwinae*, male (QM S38609). **A**, Habitus, dorsal view; **B**, Same, ventral view; **C**, Prosoma, frontal view, male. **D**, Mouthparts, ventral view, male; **E**, Male palp, prolateral view. **F**, Same, ventral view; **G**, Same, retrolateral view. Scale 1 mm.

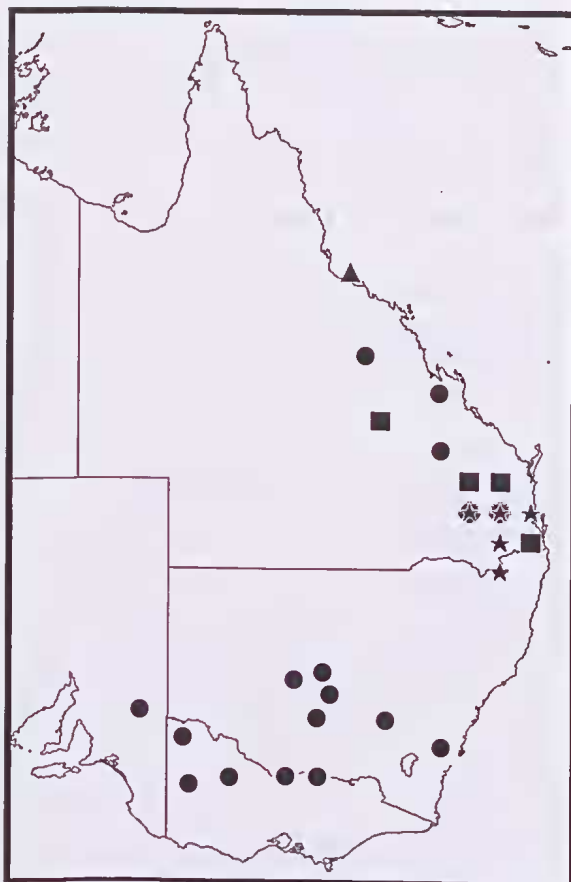


FIG. 11. Distribution of *Leichhardtus*. Circle: *L. conopalpis*. Star: *L. albofasciatus*. Square: *L. badius*. Triangle: *L. binnaculatus*.

***Leichhardtus conopalpis* sp. nov.**
Baehr & Raven
 (Figs 1, 2A, 3A–K, 11)

Etymology. The species epithet is a Latin combination of *conus* and *palpus* meaning palp with conical structure.

Material examined. New South Wales: Male holotype, Taleeban (site 4T), 33°57'S 146°27'E, C. NSW, spinifex, pitfall, 3–8 Nov 1999, D. Driscoll (QM S52729). Female allotype from Gubatta (site 3G), 33°35'S, 146°35'E, pitfall, 6–14 Dec 1999, D. Driscoll, QM (S53920).

Other material. New South Wales: 1♀ 1♂, Barmah forest, 35°56'S 145°03'E, tree trunk, Nov 2001, A. Ballinger (QM S92341); 2♂, Bungonia, 34°52'S 149°57'E Jan 1990, G.S. Hunt (AM KS22748); 1♀ 1♂, Dananbilla Nature Reserve (gen. nov. 1 sp. nov. 1) 34°12'S 148°28'E, D9/10, 11–17 Nov. 2010; 1♀,

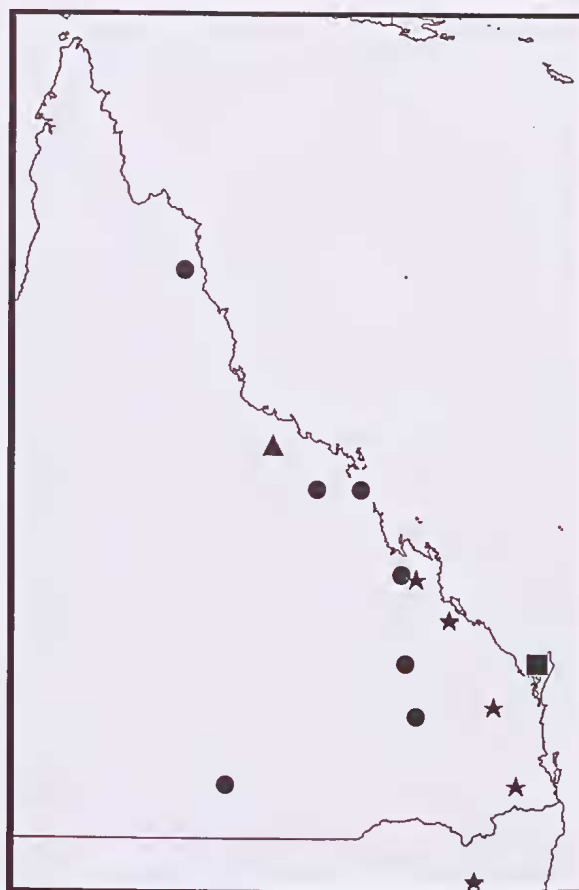


FIG. 12. Distribution of *Leichhardtus*. Circle: *L. garretti*. Star: *L. kroombit*. Square: *L. reinhardi*. Triangle: *L. terriirwiniae*.

Ned's Corner Nature Reserve (gen. nov. sp. nov. 17) 34°12'37.3"S, 141°32'06.7"E, 33 m, chenopod scrubland, 22–29.11.2011, B. Baehr, pitfall (MV); 1♀ 1♂, Gubatta (site 8G), 33°35'S 146°36'E, road verge, pitfall, 12–18 Oct 1999, D. Driscoll (QM S53143); 1♂, Gubatta (site 6G), 33°32'S 146°32'E, spinifex, pitfall, 12–18 Oct 1999, D. Driscoll (QM S52996); 2♀ Gubatta (site 9G), 33°34'S 146°32'E, spinifex, pitfall, 12–18 Oct 1999, D. Driscoll, (QM S53289); 1♂ Gubatta (site 10G), 33°36'S 146°31'E, woodland, pitfall, 12 Oct–18 Dec 1999, D. Driscoll (QM S53265); 1♂, Pulletop (site 9P), 34°01'S 146°04'E, road verge, pitfall, 12–18 Oct 1999, D. Driscoll (QM S52909); 1♂, Round Hill Nature Reserve (site 4R), 32°59'S 146°05'E, mallee, pitfall, 2–8 Nov 1999, D. Driscoll (QM S52882); 1♂ Round Hill Nature Reserve (site 6R), 32°59'S 146°03'E, C. mallee, pitfall, 2–8 Nov 1999, D. Driscoll (QM S52748); 1♂, Round Hill Nature Reserve (site 1R), 33°03'S 146°13'E, mallee, pitfall, 2–8 Nov 1999, D. Driscoll (QM S52843); 1♂ 1♀, Taleeban (site 8T),

33°53'S 146°28'E, road verge, pitfall, 12–18 Oct 1999, D. Driscoll (QM S53223); 1♂, Taleeban (site 8T), 33°53'S 146°28'E, road verge, pitfall, 3–10 Nov 1999, D. Driscoll (QM S53750); 1♂, Taleeban (site 2T), 33°55'S 146°27'E, C. NSW, spinifex, pitfall, 12–18 Oct 1999, D. Driscoll (QM S53714). Queensland: 2♀, Lake Broadwater (Site 1), 27°21'S 151°06'E, pitfall, 3 Jan–25 Feb 1986, M. Bennie (QM S50468); 1♂, same data but, 25 Feb–22 Apr 1986, M. Bennie (QM S52278); 1♂ 1♀, same data but, 16 May–23 Nov 1985 (QM S52279); 1♂ 1♀, same data but, 24 Nov 1985–3 Jan 1986, M. Bennie, (QM S52277); 1♀, same data but, 26 Jan–18 Feb 1985, (QM S50457); 1♂, Boggomoss No 3, adjacent, (BS 55) Taroom, 25°26'S 150°01'E, open forest, pitfall, 12 Jun–9 Sep 1996, P. Lawless (QM S37141); 1♂, Mazeppa National Park, N end, 22°14'S 147°15'E, brigalow, flight intercept trap, 18 Dec 2000–26 Mar 2001, D. Cook, G. Monteith, QM S56139; 1♂, Mazeppa National Park, N end, 22°14'S 147°15'E, brigalow, flight intercept trap, 18 Dec 2000–26 Mar 2001, D. Cook, G. Monteith, QM S56895; 1♂, Mt Deongwar, 3 km S (site 2), 27°14'S 152°15'E, rainforest, flight intercept trap, 14 Oct–30 Dec 1998, G. Monteith D. Cook (QM S50137); 1♀ Pheasant Creek, (Armstrong), Block 2, 6 km N house, 23°45'S 150°09'E, pitfall, 30 Sep 1993, D. Wallace (QM S44103). South Australia: 1♀, Kimba, 16 miles E, 2 Dec 1959, B. Main (WAM T121152); 1♀, (WAM T121154); 1♂, Renmark, 79 km NNW, 33°31'S 140°24'E, chenopod scrubland, 8 Nov–2 Dec 1995, K.R. Pullen (QM S92473); 1♀, Renmark, 32k N, 33°52'S 140°44'E, pitfall & intercept traps, 12 Dec 1995–25 Jan 1996, K.R. Pullen, (QM S39552); 3♂, Renmark, 32k N, 33°52'S 140°44'E, pitfall & intercept traps, 12 Dec 1995–25 Jan 1996, K.R. Pullen, (QM S39552). Victoria: 1♀, Glenrowan, 36°27'S 146°13'E 30 Mar 1993, A. Hall (AM KS35069); 1♀, Nathalia, 9 km SW, 36°06'S 145°07'E, pitfall, 17–22 Jan 1994 G. Milledge, P. Lillywhite (MV K4520); 1♂ 1♀, Yambuna, 36°06'S 145°02'E 3.5 km NE State Forest, pitfall, 27–30 Jan 1995, J. Evans, S. Hinkley, J. Wainer (MV K-6980); 1♀, (MV K-4394); 1♂, Lower Moira, 5 km ESE, 36°05'S 145°03'E, pitfall, 27–30 Jan 1995, J. Evans, S. Hinkley, J. Wainer (MV K-4400); 2♂, (MV K-4401); 1♂, 36°09'S 145°13'E, pitfall, 2–7 Dec 1994, J. Evans, S. Hinkley, M. Griffiths (MV K-4525); 1♂, Kaarimba 5 km ESE 36°10'S 145°14'E 3.5 km, pitfall, 17–22 Jan 1994, G. Milledge (MV K-4532); 1♀, McLellands Rd, 0.1 km N Rathbones Rd, 36°09'S 145°13'E, 26–30 Jan 1995, J. Evans, S. Hinkley, J. Wainer (MV K-4529); 2♂, McDonalds Rd, 1.8km S Shepparton-Barmah Rd, 36°04'S 145°02'E, 2–7 Dec 1994, J. Evans, S. Hinkley, M. Griffiths (MV K-4399); 1♀, (MV K-4398); 1♀, Wychitella, 8.5 km S, mallee site W1, 36°20'S 143°36'E, 15–20 Oct 1989, J. Coventry (MV K-4337).

Diagnosis. Males of *Leichhardtus conopalpis* resemble those of *L. garretti* in having a large conical process (like a conopalpis horn) on the ventral part of the palpal femur but males and

females can easily be distinguished by the yellow orange prosoma with front part of carapace and mouthparts are dark brown and the dark brown Opisthosoma with dorsally wide pale anterior crescent and small ovoid pale arrow-shaped spot in front of the spinnerets.

Description. Male (QMS92473): total length 8.64; prosoma length 3.76; width 2.60.

Colour. Prosoma, mouthparts and legs yellow orange; front part of carapace and mouthparts dark brown; leg IV from tibia darker. Opisthosoma dorsally dark brown with wide pale anterior crescent and small ovoid pale arrow-shaped spot posteriorly; ventrally pale centrally dark brown posteriorly, with brown flanks and 3 light brown fingers running forward from spinnerets. *Prosoma*: ALE separated from edge of carapace by 1.5 of their diameter. *Eyes*: AME: 0.25; ALE: 0.16; PME: 0.16; PLE: 0.21; AME largest; AME separated by less than their radius; AME-ALE separated by less than their radius, ALE-PLE separated by less than ALE radius, PME separated by 1.5 of their diameter, PLE-PME separated by PME radius (Fig. 3E). Sternum (Fig. 3C) surface punctated. *Opisthosoma*: ovoid (Fig. 3A) with large oval dorsal scute covering 3/4 of abdomen, venter with yellow orange epigastric scute. *Palp*: Femur with conical process about diameter of femur long (Fig. 3I). Cymbium with conical spine-like process; embolus broad with reflexed flattened apex.

Female (QM S53920). Total length 8.21; prosoma length 4.18; width 2.89. *Eyes*: AME: 0.28; ALE: 0.22; PME: 0.15; PLE: 0.17. *Abdomen* with small dorsal scute. *Epigyne* (Fig. 3J, K) about as long as wide, copulatory openings (CO) near lateral margin about halfway between epigastric fold and anterior end of epigyne, epigynal ducts short, semicircular, laterally connected to S-shaped spermathecae, spermathecae anterior part pear-shaped smooth with small lateral glandulae, posterior part with 4–5 diverticulae.

Distribution. *Leichhardtus conopalpis* is the most common species with a wide distribution in eastern Australia, common in chenopod scrubland (Fig. 11).

Leichhardteus albofasciatus sp. nov.

Baehr & Raven.

(Figs 2F, 4A–K, 11)

Etymology. The species epithet is a Latin combination of *albus*, *alba* –um an adjective meaning white and *fasciata* noun meaning stripe, streak, band meaning with white band.

Material examined. Queensland: Male holotype, Mt Tamborine, Curtis Falls, 27°58'S 153°11'E, 23 Jun 1982, H. Parnaby (QM S29577). Female Allotype from Lamington National Park (IBISCA) 700A, (S76352) 28°18'S 153°12'E, rainforest, fungus pitfall, 16–21 Oct 2006, R. Menendez, G. Monteith, (QM S76352).

Other material. New South Wales: 2♀, Beaury State Forest, 705m 28°32'S 152°20'E, 4 Feb–9 Apr 1993, M. Gray, G. Cassis (AM KS 036162); 1♂, 1♀, Chaelundi State Forest, 3.8 km w along Stockyard fire trail from Chandler 29°57'S 152°31'E, 4 Feb–9 Apr 1993, M. Gray, G. Cassis (AM KS40175). Queensland: 1♂, Lamington National Park, O'Reillys Guest House, 28°14'S 153°08'E, flight intercept trap, 27 Dec 1981–15 Jan 1982, G. Monteith (QM S29489); 2♂, Lamington National Park, O'Reillys, Wishing Tree Circuit, 28°15'S 153°09'E, rainforest, pitfall, 27 Dec 1981–15 Jan 1982, Monteith, Raven, Yeates (QM S29493); 1♂, Lamington National Park, Binna Burra, 28°12'S 153°10'E, pitfall, 23–24 Oct 2003, G. Monteith (QM S62521); 1♂, Mapleton Falls National Park, 26°37'S 152°50'E, rainforest, flight intercept trap, 30 Nov 1991–8 Jan 1992, D.J. Cook (QM S31537); 1♀, Mt Glorious (Hiller HS), 27°20'S 152°46'E, rainforest, malaise trap, 12 Dec 1998–28 Jan 1999, N. Power (QM S91807); 1♀, Mt Glorious, 27°20'S 152°46'E, rainforest, 1 Feb 1973, R. J. Raven (QM S29407); 1♀ 1♂, Mt Mee, 27°03'S 152°41'E, rainforest, intercept flight trap, 29 Nov 1991–8 Jan 1992, D. J. Cook, QM S50412; 1♂, Nichols Scrub, 28°11'S 153°26'E, rainforest, intercept flight trap, 1 Jan 1992–4 Mar 1992, D. J. Cook (QM S39688); 1♀, Redwood Park, Toowoomba, 27°35'S 151°57'E, rainforest, pitfall, 1–23 Dec 1991, G. Monteith, H. Janetzki (QM S50421); 1♂, Toowoomba, Redwood Park, 27°35'S 151°37'E, 350m, pitfall 23 Dec 1991–10 May 1992, H. Janetzki (QM S25194); 2♂ 2♀, Top of Blackbutt Range, 26°52'S 152°11'E, rainforest, flight intercept trap, 24 Nov 1995–3 Feb 1996, G. Monteith (QM S60624).

Diagnosis. Males of *Leichhardteus albofasciatus* resemble those of *L. badius* and *L. reinhardi* in having no conical process but an enlarged palpal femur, fringed with a line of long setae but males and females can be easily distinguished by the dark opisthosoma with a longitudinal pale stripe.

Description. Male (QM S29577): total length 6.31 prosoma length 3.29; width 2.51.

Colour. Prosoma, mouthparts and legs yellow brown. Opisthosoma dorsally dark brown with wide pale dorsomedian stripe; ventrally pale with broad median dark brown stripe. **Prosoma:** ALE separated from edge of carapace by twice their diameter. **Eyes:** AME: 0.20; ALE: 0.17; PME: 0.18; PLE: 0.18; AME largest; AME separated by less than their radius; AME–ALE separated by less than their radius, ALE–PLE separated by less than ALE radius, PME separated by 1.5 of their diameter, PLE–PME separated by PME radius (Fig. 4A). **Opisthosoma:** ovoid (Fig. 4A) without dorsal scute, venter with thin yellow orange epigastric scute. **Palp** (Figs 4G–I): Femur ventrally bulging fringed with line of long setae, without conical process. Cymbium with conical spine-like process; embolus narrow twisted twice with thin apex.

Female (QM S76352). Total length 9.63; prosoma length 3.84; width 2.87. **Eyes:** AME: 0.24; ALE: 0.21; PME: 0.20; PLE: 0.21. **Epigyne** (Fig. 4J, K) wider than long, copulatory openings (CO) circular, anterior half chitinized, epigynal ducts short, thick, semicircular, spermathecae strongly S-shaped, anterior part pear-shaped smooth with small lateral glandulae, posterior part with about 3 diverticulae.

Remarks. *Leichhardteus albofasciatus* is most likely living together with *Leptomyrmeus tibialis* Emery, 1895 and *Leptomyrmeus cnemidatus* Wheeler, 1915 (Lucky & Ward 2010) which both are found in Lamington National Park rainforest, as the specimen of QM S62521 was collected together with *Leptomyrmeus tibialis* Emery, 1895.

Distribution. *Leichhardteus albofasciatus* is found in rainforests through southern Queensland and northern NSW (Fig. 11).

Leichhardteus badius sp. nov.

Baehr & Raven

(Figs 2H, 5A–K, 11)

Etymology. The specific name *badius* is Latin referring to *badini* an adjective meaning reddish-brown which refers to the body colour and is chosen in honour of Bob Brown, former leader of

the Australian Greens who rescued rainforest environments.

Material examined. Queensland: Male holotype, Bunya Mountains National Park, behind Rice's cabins, 26°53'S 151°35'E, rainforest, malaise trap, 13–17 Jan 1998, C. Lambkin, (QM S31555); female allotype from Bunya Mountains National Park, Dandabah, 26°54'S 151°33'E, sweeping/ beating, 1–7 Mar 1976, V. Davies, L. Chapman, (QM S31545).

Other material. Queensland: 3♂ 2♀, Bunya Mountains National Park, behind Rice's cabins, 26°53'S 151°35'E, rainforest, malaise trap, 13–17 Jan 1998, C. Lambkin (QM S31556); 1♀, 2 Mar – 12 Apr 1992 (QM S92343); 1♂, 1♀, Mt Moffatt National Park, Mahogany Forest, 24°57'S 148°02'E, open forest, intercept flight trap, 26 Sep–26 Nov 1995, G. Monteith (QM S38558); 1♀, Numinbah State Forest, 28°12'S 153°13'E, rainforest, on bark, 22 Nov 1979, T. Robinson (QM S29412); 3♂, 2♀, Saddle Tree Creek, 26°51'S 151°38'E, rainforest, flight intercept trap, 7 Jan – 1 Mar 1992, D. J. Cook (QM S59047); 8♂ 1 Dec 1991 – 7 Jan 1992 (QM S50419); 1♀ The Palms via Cooyar, 26°56'S 151°53'E, rainforest, pitfall, 25 Oct 1975–25 Jan 1976, G. & S. Monteith (QM S29397); 3♂ 2♀, (QM S50417); 1♂, Yarraman, 26°51'S 152°00'E, rainforest, flight intercept trap, 1 Dec 1991–7 Jan 1992, D.J. Cook (QM S50420);

Diagnosis. Males of *Leichhardtus badius* resemble those of *L. albofasciatus* in having no conical process but an enlarged palpal femur but males and females can be easily distinguished by having abdominal scutes and the pale chevrons on the dorsal side of the abdomen.

Description. *Male* (QM S31555): total length 6.19 prosoma length 3.16; width 2.47.

Colour. Prosoma, mouthparts reddish brown, legs yellow brown. Opisthosoma dorsally dark brown with wide pale chevrons covering the whole dorsum; ventrally pale with broad median dark brown band. *Prosoma*: ALE separated from edge of carapace by twice their diameter. *Eyes*: AME: 0.21; ALE: 0.17; PME: 0.16; PLE: 0.17; AME largest; AME separated by less than their radius; AME-ALE separated by less than their radius, ALE-PLE separated by less than ALE radius, PME separated by 1.33 of their diameter, PLE-PME separated by PME radius (Fig. 5A). *Opisthosoma*: ovoid (Fig. 5A) with long dorsal scute, venter with thin yellow orange epigastric scute. *Palp* (Figs 5G–I): Femur ventrally bulging fringed with line of long setae, without conical process. Cymbium

with conical spine-like process; embolus broad medially, twisted twice with thin apex.

Female (QM S31545). total length 9.11; prosoma length 4.00; width 3.06. *Eyes*: AME: 0.22; ALE: 0.20; PME: 0.21; PLE: 0.20. *Epigyne* (Fig. 5J, K) longer than wide, copulatory openings (CO) circular, $\frac{3}{4}$ of rim chitinated, epigynal ducts stout, semicircular, laterally connected to S-shaped spermathecae, spermathecae anterior part pear-shaped, smooth with small lateral glandulae, posterior part with about 4 diverticulae.

Distribution. *Leichhardtus badius* is common in rainforests through southern Qld (Fig. 11).

Leichhardtus bimaculatus sp. nov.

Baehr & Raven
(Figs 2C, 6A–H, 11)

Etymology. The specific name *L. bimaculatus* is Latin, meaning 2 spots, referring to the two spots on the dorsal side of the opisthosoma.

Material examined. Queensland: Male holotype, Conway National Park, 20°25'S 148°49'E, rainforest, (3 Sep 1988, R. Raven, J. Gallon, T. Churchill, (QM S14709). Paratypes: 1♂ from Mt Cleveland, 500 m, 19°16'S 147°03'E, pitfall traps, Jan–March 1991, A. Graham, (QM S17980).

Diagnosis. Males of *Leichhardtus bimaculatus* resemble those of *L. kroonibit* in having only a slightly bulging femur but males and females can be easily distinguished by having 1 pair of white spots on the dorsum of the abdomen and distinct distal dark stripes on femora II–IV.

Description. *Male* (QM S14709): total length 6.50 prosoma length 3.23; width 2.28.

Cephalothorax. Prosoma, mouthparts blackish brown, legs pale yellow with darker marking on femora and patellae. Opisthosoma dorsally dark brown with 1 pair of white spots at middle and 2 small spots in front of the spinnerets; ventrally dark brown with 1 long white median spot and 2 pairs of lateral ones. *Prosoma*: ALE separated from edge of carapace by 1.5 times their diameter. *Eyes*: AME: 0.20; ALE: 0.14; PME: 0.16; PLE: 0.17; AME largest; AME separated by less than their radius; AME-ALE separated by less than their radius, ALE-PLE separated by less than ALE radius, PME separated by 1 $\frac{1}{3}$

of their diameter, PLE-PME separated by PME radius (Fig. 6A). *Opisthosoma*: ovoid (Fig. 6A) with long dorsal scute, venter with thin yellow orange epigastric scute. *Palp* (Figs 6 E-H): Femur ventrally slightly bulging, without conical process. Embolus narrow at median part twisted 1 ½ with thin apex.

Female. Unknown

Distribution. *Leichhardteus bimaculatus* is known only from rainforest at Conway Range National Park and Mt Cleveland, in mid-eastern and northern QLD (Fig. 11).

Leichhardteus garretti sp. nov.
Baehr & Raven
(Figs 2B, 7A-M, 12)

Etymology. The specific name *garretti* is in honour of Peter Garrett, former Minister of Environment for his engagement for the study of the Australian environment.

Material examined. Queensland: Male holotype, Wonga Hills, 26°04'S 150°49'E, vine scrub, 480 m, pitfall trap site 1, 11 Dec 2001–4 Mar 2002, G. Monteith, D. Cook, (QM S68111); female allotype, same as holotype, except 500 m, site 2, QM S68110).

Other material. Queensland: 1♀, Mt Gavial, 1 km S, 23°36'S 150°29'E, open forest, pitfall, 17 Dec 1998–14 Mar 1999, D. J. Cook (QM S50054); 1♂, Mt Molloy, 17 km S, 16°49'S 145°22'E, low open woodland, baited pitfall trap, 6–9 Feb 1998, G. Monteith D. Cook, (QM S50888); 1♂, Mt Robert, 2 km NNW, 21°21'S 148°29'E, semi-evergreen vine thicket, flight intercept trap, 19 Dec 2000–25 Mar 2001, D. Cook, G. Monteith, (QM S56904); 1♀, 19 Dec 2000–25 Mar 2001 (QM S55397); 1♂, North East Island, Percy Is, 21°42'S 150°20'E, 30 Oct 1936, C. White (QM S12251); 1♂, Taroom district, Boggomoss 12, Nathan Gorge, 25°27'S 150°08'E, 13 Nov 1996, QLD Museum survey (QM S36940); 1♂ Upper Hall Creek via Carmila, 21°52'S 149°18'E, open forest, pitfall, 4 Dec 1996–6 Apr 1997, G. Monteith, E. Maulder (QM S41729); 1♂, Wonga Hills, 26°04'S 150°49'E, vine scrub, 480m, pitfall trap site 1, 11 Oct–11 Dec 2001, G. Monteith, D. Cook (QM S60633).

Diagnosis. Males of *Leichhardteus garretti* resemble those of *L. conopalpis* and *L. terriirwiniae* in having palpal femur with ventral conical process but males and females can be easily distinguished by having dark coloured body and legs not annulated.

Description. *Male* (QM S68111): total length 6.27 prosoma length 3.11; width 2.15.

Colour. Prosoma, mouthparts reddish brown, legs yellow brown coxae trochantera and femora dark brown. *Opisthosoma* dorsally dark brown with 3 small spots in front of spinnerets; ventrally dark brown with pale median band. *Prosoma*: ALE separated from edge of carapace by 1.5 times their diameter. *Eyes*: AME: 0.20; ALE: 0.17; PME: 0.13; PLE: 0.16; AME largest; AME separated by less than their radius; AME-ALE separated by less than their radius, ALE-PLE separated by less than ALE radius, PME separated by 1.5 of their diameter, PLE-PME separated by PME radius (Fig. 7A). *Opisthosoma*: ovoid (Fig. 7A) with long dorsal scute 2/3 of opisthosoma long, venter with orange brown epigastric scute. *Palp* (Figs 7 I-K): Femur ventrally with conical process. Cymbium with conical spine-like process; embolus broad at median part twisted twice with thin apex.

Female (QM S68110). Total length 6.83; prosoma length 4.00; width 2.25. *Eyes*: AME: 0.17; ALE: 0.16; PME: 0.16; PLE: 0.16. *Epigyne* (Fig. 7 L, M). wider than long, copulatory openings (CO) circular, ¾ of rim chitinized with median black dot, epigynal ducts slender, S-shaped, spermathecae slightly S-shaped, anterior part pear-shaped smooth with small lateral glandulae, posterior part with about 4 diverticulae.

Distribution. *Leichhardteus garretti* is found in open forest and vine thickets through coastal northern Queensland (Fig. 12).

Leichhardteus kroombit sp. nov.
Baehr & Raven
(Figs 2D, 8A-K, 12)

Etymology. The specific name is a noun in apposition taken from the type locality.

Material examined. Queensland: Male holotype, Kroombit Tops, Three Moon Creek, 24°21'S 151°00'E, rainforest, 9–19 Dec 1983, V. Davies, J. Gallon, (QM S92472). Female allotype, same as holotype (QM S31542).

Other material. New South Wales: 1♂, Styx River State Forest, 30°33'S 152°20'E, 1080m, 4 Feb–9 Apr 1993, M. Gray, G. Cassis (AM KS035392). Queensland:

1♀, Black Rock Scrub, 28°07'S 152°39'E, rainforest, flight intercept trap, 2 Dec 2000–13 May 2001, G. Monteith (QM S56143); 1♀, Dwyer Creek, Imbil, 26°28'S 152°38'E, hoop pine scrub, flight intercept trap, 24 Sep 2000–15 Jan 2001, G. Monteith (QM S78590); 1♀, Kroombit Tops, northern escarpment, 24°25'S 151°03'E, open forest, 9–19 Dec 1983, V. Davies, J. Gallon (QM S29474); 1♀, Kroombit Tops, Three Moon Creek, 24°21'S 151°00'E, rainforest (23 Feb 1982, G. Monteith, R. Raven, D. Yeates, (QM S29492); 1♀, Little Yabba Creek, 150 m, 26°37'S 152°41'E, rainforest, intercept traps, 7 Jan–2 Mar 1992, D. Cook (QM S91394); 2♂, Kroombit Tops (Site 9), Lower Dry Creek, 24°24'S 151°01'E, rainforest, pitfall, 11–18 Dec 1983, G. Monteith, V. Davies, J. Gallon, G. Thompson (QM S29472); northern escarpment, 24°25'S 151°02'E, open forest 9–19 Dec 1983, V. Davies, J. Gallon (QM S29474); 1♀, Mt Gavial, 3 km SSW, 320 m, 27 Sep 1999, G. Monteith, D. Cook, C. Burwell (QM S79281).

Diagnosis. Males of *Leichhardteus kroombit* resemble those of *L. bimaculatus* in having a relatively slim palpal femur without ventral conical process but males and females can be easily distinguished by having a double X-shaped pale pattern at the front of their dark abdomen.

Description. *Male* (QM S92472): total length 7.38; prosoma length 3.95; width 2.76.

Colour. Prosoma, mouthparts reddish brown, legs yellow brown femora slightly darker. Opisthosoma dorsally dark brown with double X-shaped pale pattern at the front and 3 small spots in front of spinnerets (Fig. 8A); ventrally dark brown with pale area in front of epigastric area. *Prosoma*: ALE separated from edge of carapace by twice their diameter. *Eyes*: AME: 0.28; ALE: 0.22; PME: 0.25; PLE: 0.24; AME largest; AME separated by less than their radius; AME–ALE separated by less than their radius, ALE–PLE separated by less than ALE radius, PME separated by their diameter, PLE–PME separated by 2/3 of PME diameter (Fig. 8A). *Opisthosoma*: ovoid (Fig. 8A) with long dorsal scute 3/4 of Opisthosoma long, venter with orange epigastric scute. *Palp* (Figs 8G–I): Femur ventrally only slightly bulging, without conical process. Cymbium with retrobasal conical spine-like process; embolus broad at median part twisted twice with thin apex directed distally.

Female (QM S31542). Total length 9.71; prosoma length 4.62; width 3.43. *Eyes*: AME: 0.28; ALE: 0.22; PME: 0.26; PLE: 0.24. *Epigyne* (Fig. 8J,K) about as long as wide, copulatory openings (CO) circular, complete rim chitinated, epigynal ducts short, stout, semicircular, spermathecae S-shaped, posterior part with 5 diverticulae.

Distribution. *Leichhardteus kroombit* is known from rainforest and open forest at Kroombit Tops, SE Qld, to the Styx River in northern New South Wales (Fig. 12).

Leichhardteus reinhardi sp. nov.

Baehr & Raven
(Figs 2G, 9A–K, 12)

Etymology. The specific name *L. reinhardi* is chosen in honour of Reinhard Flessner, University of Queensland's Manager of Collaboration and Research in Europe, for his immense engagement for Leichhardt and the Australian environment.

Material examined. Queensland: Male holotype, from Fraser Island, Orchid beach, 25°25'S 153°16'E, 11–14 Feb 2000, B. Baehr, R. Raven, (QM S92342). Female allotype same as holotype deposited in QM (S79286).

Diagnosis. Males of *Leichhardteus reinhardi* resemble those of *L. albofasciatus* in having a swollen ventral part of the palpal femur, fringed with a line of long setae but can be easily distinguished by the dark opisthosoma without a pale median stripe.

Description. *Male* (QM S92342): total length 6.09; prosoma length 2.97; width 2.01.

Colour. Prosoma yellow orange, front and mouthparts dark brown, legs yellow brown tibia and metatarsus IV distally darker. Opisthosoma dorsally completely dark brown (Fig. 9A); ventrally dark brown, pale in front of epigastric area. *Prosoma*: ALE separated from edge of carapace by 1.5 times their diameter. *Eyes*: AME: 0.28; ALE: 0.22; PME: 0.25; PLE: 0.24; AME largest; AME separated by less than their radius; AME–ALE separated by less than their radius, ALE–PLE separated by less than ALE radius, PME separated by their diameter, PLE–PME separated by 2/3 of PME diameter (Fig. 9A). *Opisthosoma*: ovoid (Fig. 8A) with long dorsal scute 3/4 of Opisthosoma long,

venter with orange epigastric scute. *Palp* (Figs 8G–I): Femur ventrally bulging, fringed with a line of long setae, but without conical process. Cymbium with retrobasal conical spine-like process; embolus broad at median part twisted twice with thin apex directed distally.

Female (QM S79286). Total length 9.71; prosoma length 4.62; width 3.43. *Eyes*: AME: 0.20; ALE: 0.12; PME: 0.13; PLE: 0.13. *Epigynae* (Fig. 9J, K) about as long as wide, copulatory openings (CO) circular, apical 1/2 of rim chitinized hood-shaped, epigynal ducts short, stout, semicircular, spermathecae anterior part pear-shaped smooth with small lateral glandulae, posterior part with about 6 diverticulae.

Distribution. *Leichhardteus reinhardi* is known only from Fraser Island, SE Qld (Fig. 12).

Leichhardteus terriirwinae sp. nov.
Baehr & Raven
(Figs 2E, 10A–G, 12)

Etymology. The species is named in honour of Terri Irwin, one of the most courageous women supporting Australia's wildlife.

Material examined. Queensland: Male holotype, from Mt Aberdeen, north summit, rainforest, 850 m, 20°12'S, 147°55'E, 5–7 Dec 1996, G. Monteith, D. Cook, (QM S38609).

Diagnosis. Males of *Leichhardteus terriirwinae* resemble those of *L. garretti* in lacking a dorsal scute and having ventral part of the palpal femur with conical process and but can be easily distinguished by their annulated legs and the slim embolus.

Description. *Male* (QM S38609): total length 6.55; prosoma length 3.51; width 2.42.

Cephalothorax. Prosoma and mouthparts dark brown, legs white, femora and distally dark brown. Opisthosoma dark brown with large pale fork-shaped patch at front and 3 combined spots in front of the spinnerets (Fig. 10A); venter dark brown with 3 longitudinal white stripes. *Prosoma*: ALE separated from edge of carapace by twice their diameter. *Eyes*: AME: 0.18; ALE: 0.16; PME: 0.14; PLE: 0.11; AME largest; AME separated by less than their

radius; AME–ALE separated by less than their radius, ALE–PLE separated by less than ALE radius, PME separated by their diameter, PLE–PME separated by 3/4 of PME diameter (Fig. 10A, C). *Opisthosoma*: ovoid (Fig. 10A) without scute, venter with thin orange epigastric scute. *Palp* (Fig. 10 G–I): Femur ventrally with conical process. Cymbium with retrobasal conical spine-like process; embolus slim at median part twisted twice with thin apex directed distally.

Female. Unknown.

Distribution. *Leichhardteus terriirwinae* is known only from Mt Aberdeen, NE Qld (Fig. 12).

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LITERATURE CITED

- Baehr, B.C. 2011. The Australian goblin spiders of the Genus *Opopaea* Simon, part 1. The species of the IBISCA–Queensland project at Lamington National Park (Araneae: Oonopidae). *Memoirs of the Queensland Museum* 55, 413–437.
- Baehr, B.C., Raven, R.J. & Hebron, W. 2011. Orsolobidae (Araneae) of the IBISCA–Queensland Project at Lamington National Park, Australia. *Memoirs of the Queensland Museum – Nature* 55, 439–449.
- Bonaldo, A.B. & A.D. Brescovit 2005. On new species of the Neotropical genus *Attacobius* Mello-Leitao, 1923 (Araneae, Corinnidae, Corinninae), with a cladistic analysis of the tribe Attacobiini. *Insect Systematics and Evolution* 36: 35–56.
- Haddad, C.R. 2006a. *Spinotrachelas*, a new genus of tracheline sac spiders from South Africa (Araneae: Corinnidae). *African Invertebrates* 47: 85–93.

- 2006b. A revision of the Afrotropical tracheline sac spider genus *Thysanina* Simon, 1910 (Araneae: Corinnidae). *African Invertebrates* 47: 95–116.
- Haddad, C.R. & J. Bosselaers 2010. A revision of the genus *Medmassa* Simon, 1887 (Araneae: Corinnidae) in the Afrotropical Region. *Zootaxa* 2361: 1–12.
- Harvey, M.S. 2002. Short-range endemism in the Australian fauna: some examples from non-marine environments. *Invertebrate Systematics* 16: 555–570.
- Karsch, F. 1880. Arachnologische Blätter (Decas I). *Zeitschrift für die gesammten Naturwissenschaftler* 53: 373–409.
- Lucky A. & Ward P.S. 2010. Taxonomic revision of the ant genus *Leptomyrmex* Mayr (Hymenoptera: Formicidae). *Zootaxa* 2688: 1–67.
- Lyle, R. & C.R. Haddad 2010. A revision of the tracheline sac spider genus *Cetouana* Strand, 1929 in the Afrotropical region, with descriptions of two new genera (Araneae: Corinnidae). *African Invertebrates* 51: 321–384.
- Simon, E. 1897. *Histoire naturelle des araignées*. Paris, 2: 1–192.